

# MASSACHUSETTS AGRICULTURAL COLLEGE



## Agricultural Vocations

1914

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# The M. A. C. Bulletin

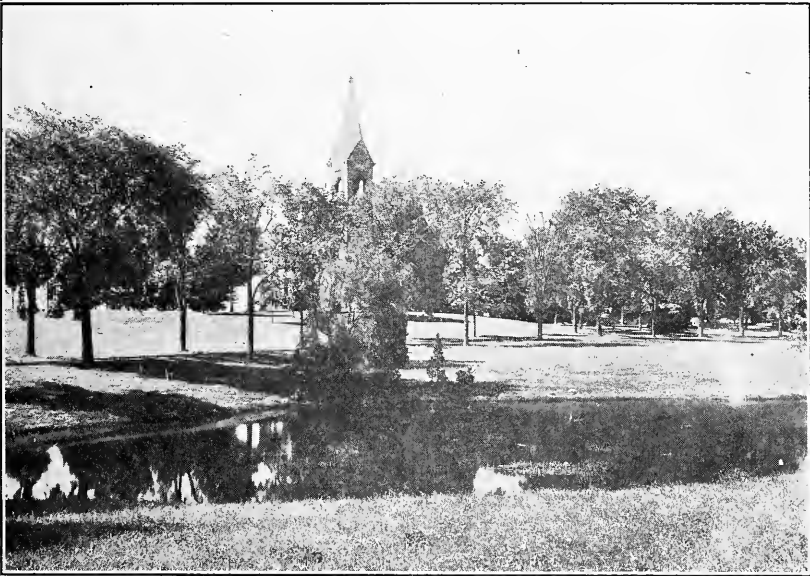
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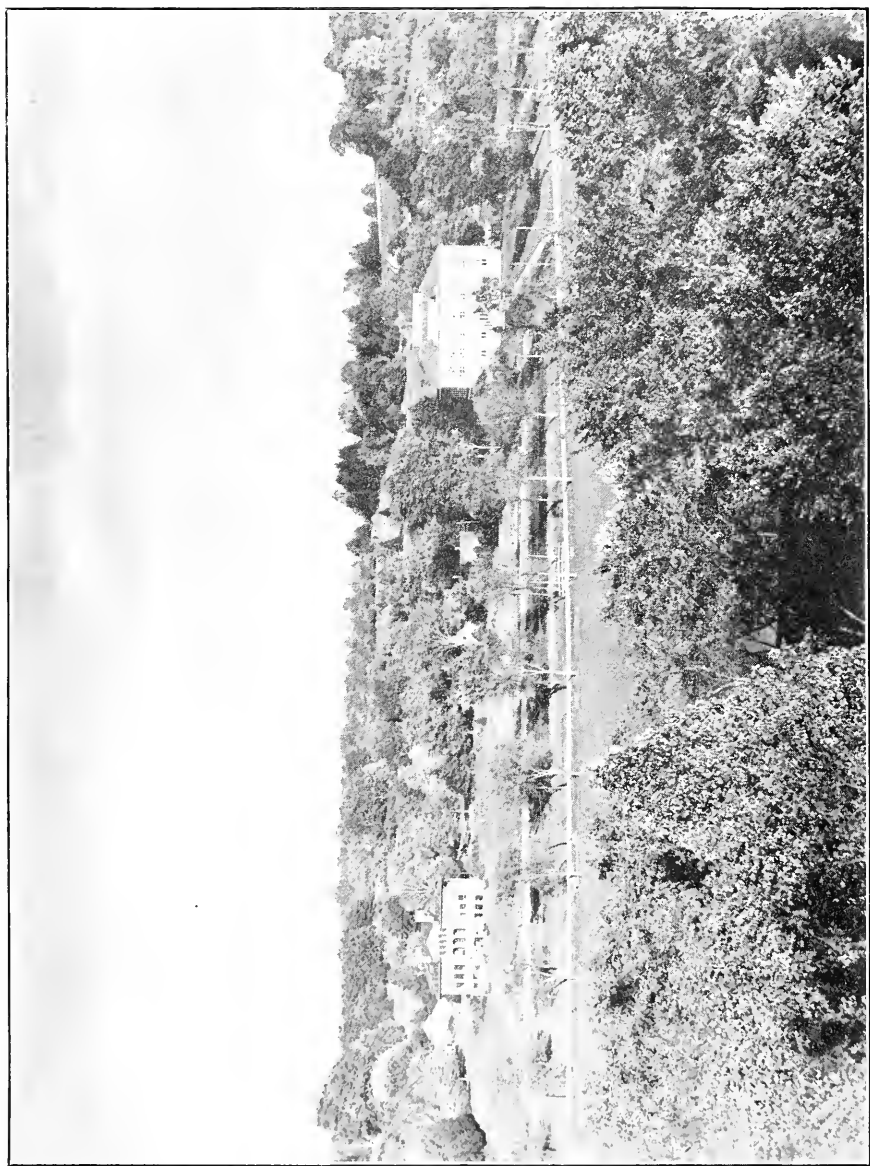


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East Side of the Campus

## Foreword



UNTIL comparatively recent years few men ambitious for a college course supposed that they could find a satisfying career in connection with agriculture. Today, the call for men to serve in varied and important places in the agricultural field is beyond the ability of the agricultural colleges to supply. These pages are intended to outline some of the most attractive and significant of these new openings for able young men, and to advise with reference to the educational training necessary.

Not long ago the writer of a book about college life and work stated that the main business of the college is to train "problem-solvers." I like the words. They suggest definite work to be done in the world, big work, hard work, useful work. They appeal to men of force and will, and to men who want to make their lives count not alone for themselves, but for the world's welfare. So I like to think that the main mission of the modern agricultural college is to train men to become rural problem-solvers. And now these problems keep arising — knotty, interesting, important problems of human wealth and welfare that can be solved only by men — trained men.

There are the practical problems of producing adequate food for the city dwellers, of making farming "pay" by the use of modern methods. A rapidly increasing number of agricultural college graduates are ambitious to prove that practical agriculture — right here in New England, too — offers a real career for a brainy, alert, ambitious, college man. And they are proving it.

There are the problems of farm business, farm management, buying and selling to advantage. Men who have the business instinct are finding in this field problems "worthy their steel." There are big economic problems to be solved: rural credit, farm labor, the great tenant-farming question. There are engineering problems: irrigation, machinery, use of power, roads, public sanitation.

There are social and moral problems: making better schools, the education of adult farmers, the building up of the country church to its rightful place of leadership, the fascinating work of the rural Young Men's Christian Association, the recreative side of rural life,

rural home life and district nursing for women, and the wonderful fields of scientific investigation.

These are but hints of the great and increasing multitude of rural problems to be solved. Their solution is vital, not alone to our country-life involving its fifty millions of people, and to our largest industry with its forty billions of invested wealth, but vital also to the national prosperity and welfare.

The solution of these interesting and important problems awaits the problem-solvers — the rural-problem-solvers. They are coming out of our agricultural colleges every year in greater numbers. They are finding fascinating opportunities, fair financial reward, a chance to “lend a hand” in building our American life, and no end of good hearty work for full-blooded men. This work is not for all men. It means accurate knowledge of rural affairs, the willingness to work hard, the desire to serve, the belief in the importance of the task. For men who hear the call to become rural-problem-solvers, the fields are white already unto harvest.

KENYON L. BUTTERFIELD,

*President Massachusetts Agricultural College.*



Farm and Farm Buildings

## Agronomy

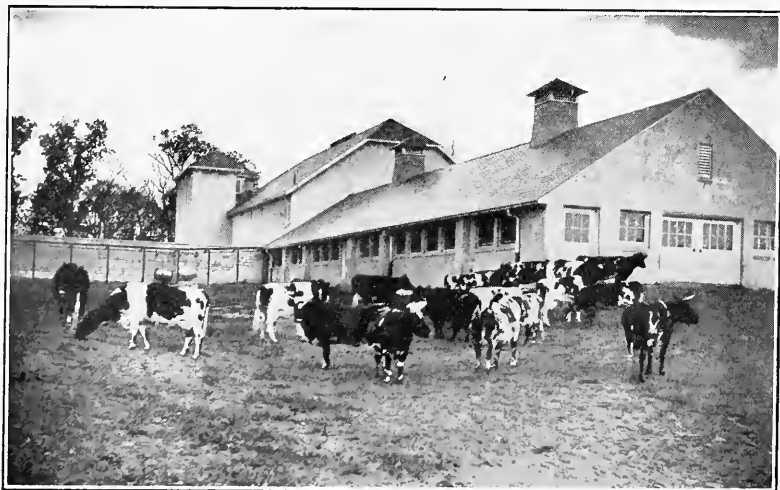
The Massachusetts Agricultural College is peculiarly well located for the study of soils, and for the study of different forms of agriculture in their effects on soil fertility. According to the survey of the United States Department of Agriculture there are located in the Connecticut Valley fourteen distinct soil types. Twelve of these are within easy walking distance of the college, and are studied in those courses given by the department of agronomy. On these several types of soil are found many different forms of agriculture, varying from those semi-abandoned farms which were allowed to run wild after grain production became unprofitable half a century ago, and now in some cases being taken up for orcharding, to well-developed dairy and general farms, and to intensively cultivated onion and tobacco farms. Since there are in this region no extensive grain and stock farms, students specializing in agronomy are advised to spend at least one summer before graduation on a farm of this kind in some one of the middle western states.

The aim of the college through its department of agronomy is to train teachers and investigators in soil fertility and crop production. The subject is now usually separated into two parts, so that there are two distinct groups of requirements for the trained agronomist: for specialists in soil fertility, which requires a working knowledge of geology, chemistry, and soil microbiology; and for specialists in crop

production particularly as related to the great staple food, forage, and fibre crops, requiring a basic knowledge of chemistry, botany, plant pathology, and plant breeding. Both sub-divisions require the fullest farm experience on the part of the student so that it is advisable, in case one has not had the benefit of such training, that he obtain it as quickly and as thoroughly as possible — preferably before he enters the college. Moreover, since the amount of scientific knowledge required is large, the student choosing agronomy must have a natural love for the sciences and must be willing later on to do enough post-graduate work to perfect his preparation in his chosen branch of the subject.

The demand for men comes mainly from the different state experiment stations, from the fertilizer companies, and from the United States Department of Agriculture. The field is developing so rapidly that there is a growing demand for highly trained men, but it is almost impossible to get this training within the limits of a four years' course. Graduate work will usually be necessary before the student can fill the larger and better paid positions.

Since agronomy concerns itself chiefly with the underlying principles governing crop production, it is not an end in itself and those students desiring to prepare themselves for a practical vocation are advised to elect considerable work in other agricultural departments of the college.



College Live Stock



## Animal Husbandry

The animal husbandry department of the Massachusetts Agricultural College endeavors to insure a scientific yet practical training in the various lines of work pertaining to the successful production of live stock and to the successful management of farms devoted to live stock production. The students are given lectures and laboratory work relating to the market grades and classes of horses, cattle, sheep, and swine. This is followed by a study of the origin, history, adaptations, and the type of the various breeds of stock, especially of dairy cattle, draft horses, sheep, and swine. This instruction is accompanied by the study of representatives of the various breeds supplemented by visits to herds of superior cattle. Animal nutrition, the composition of feed stuffs and their characteristics and uses are fully studied; likewise the feeding, care, housing, and management of horses, cattle, sheep, and swine, emphasis being given to the raising of young stock, the care of breeding stock, economic milk production, profitable pork production, the possibilities of beef making, and the breeding and feeding of work stock. The development of the various breeds of live stock in America is reviewed with a study of the methods of breeding and management of the most successful breeders. Principles and practices of breeding are studied and application made of the most recent achievements of the research laboratories of the country in their bearing upon live stock production.

Combined with these specific animal studies are those in the handling of milk, the production of crops, the study and management of the soil, and farm management. The broader experience which many students need, however, cannot be given in a college course. To meet this need the animal husbandry department arranges for summer work upon superior live stock farms.

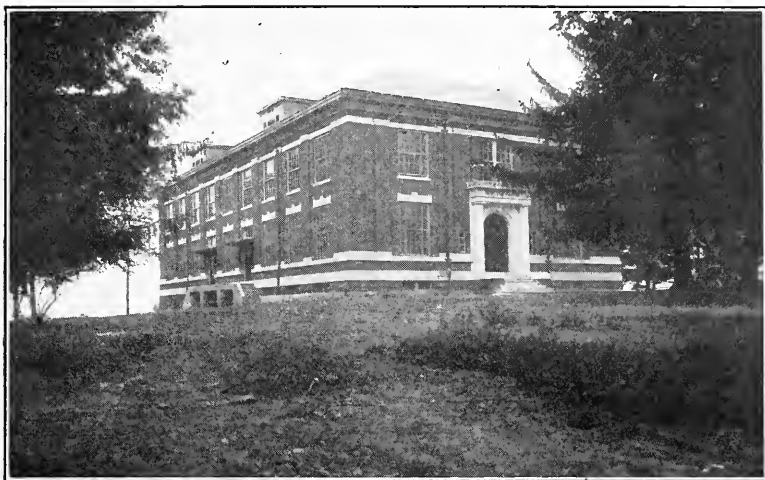
The courses as here outlined are intended to prepare men for the successful production of live stock and live stock products upon farms of their own; this is the main purpose of the course and herein lies the greatest opportunity. Men who have completed this major, with the summer work accompanying it, are equipped to be efficient herdsmen and breeders, and after devoting a year or two as assistants to good managers they should be fit for responsible managerial positions.

The field for capable live stock men has never offered greater opportunities. Better prices never prevailed for superior pure bred stock or for live stock products. For the young man who knows type, who can breed and feed to secure high economic production and to perpetuate it through successive generations, a place of wide influence and distinctive service with its financial accessories is waiting. Business and professional men more and more are making their homes in agricultural sections and instituting in connection with them live stock farms; these men must secure capable and efficient managers and foremen. Massachusetts needs more milk of higher quality — more milch cows of superior individuality; hundreds of thousands of dollars are spent every year by the State for western work horses, beef, pork, and mutton; thousands of acres are growing to brush that might be producing the finest meats. Surely here are real opportunities for the college trained man of knowledge and skill in practice.

In addition to the practical vocations, there is an increasing demand for men who can teach the fundamentals pertaining to live stock in colleges and agricultural high schools. There is a growing demand for men who can assume positions of leadership in county and township organizations where the work consists in improving the live stock industries and the agricultural pursuits of the population. Experiment stations call for many men for the investigation and discovery of principles and the advancement of the sciences in relation to the feeding and breeding of live stock.

Additional opportunities for profitable employment lie in governmental employ; each year sees new lines of work instituted by the national government as well as expansion of old. For the direction and prosecution of this work college men are especially fitted and largely utilized.

Thus, whether a man wishes to serve and achieve success upon his own resources privately, or in a public capacity as teacher in county, state or other institutions, or as an investigator, there is abundance of opportunity in animal husbandry.



Flint Laboratory—Dairy Instruction Building

## Dairying

The dairy department at the Massachusetts Agricultural College gives instruction in the handling of milk, and in the making of dairy products. Instruction concerning dairy cattle, as to selection, breeding, and feeding is given by the animal husbandry department. There is a close relationship between these two subjects in New England, and there is a close relationship between the two departments in fitting men to handle the problems as found on the New England dairy farms. Probably the most attractive opportunities today in dairying are for men who fit themselves to work either for themselves or as superintendents for others. Men desiring to do this should remember that their agricultural college is engaged primarily in giving theoretical training, and that a man must secure practical experience under competent managers before securing the best positions.

A particular line of work that is now developing is for supervisors in county work and teaching in agricultural high schools. Men who are now engaged in this work emphasize the need of dairy knowledge and experience, as so much of our New England farming is for milk, cream, and butter production.

In addition there is a field for a limited number of men for college teachers, experiment station workers, and in work for the large milk handling and dairy products manufacturing companies.

The dairy department is now using Flint Laboratory, the new instruction building, which is one of the best equipped dairy instruction plants in the country. Certified milk is produced on the college farm; the certified plant is used for instructional purposes.



Dairy Barn

## Farm Management

There are four important factors that have an influence on success in farming in the eastern part of the United States. They are (1) training or knowledge of the business; (2) practical experience; (3) capital; (4) a fondness for country life. The agricultural college can help supply only the first of these, while the second and third are equally as important for the success of agricultural enterprises. Even with all these factors present farming does not offer the best means for acquiring great wealth. It does, however, in a unique fashion, provide opportunity for a safe investment, a good living, a good home, the exercise of influence and leadership, and the well-balanced use of both mental and physical abilities. For those students who do not wish to become independent operators, there is a fairly steady demand for well-trained men with practical experience as farm superintendents

and managers. There are also in New England many farms and estates owned by wealthy men for recreation or as summer homes, that call for competent supervision.

The organization of separate departments of farm administration or farm management in the agricultural colleges of the country is comparatively recent and for some time to come there is likely to be a demand for good teachers of this subject. The present demand for more extension and demonstration work and the establishment of farm bureaus and county advisers all over the country also offers increased opportunities for well-trained men. In all these departments practical experience is essential to success, and the student who intends to specialize in farm management should take every opportunity that occurs of working on good farms, whether it be before, during, or after his college course.

The Massachusetts Agricultural College is well prepared to supply the necessary training for general agriculture and for farm management. Instruction is given in farm accounting, dairying, animal husbandry, poultry husbandry, fruit growing, soils, fertilizers, and crops. Its large farm equipped with modern buildings, its poultry plant, dairy, and orchards, present great opportunities for acquiring a comprehensive knowledge of farming.

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## Poultry Husbandry

Probably no state in the Union offers opportunities in poultry culture comparable with those in Massachusetts. In the first place here are the best markets in the country. We have easy access to the great eastern commercial centers of Boston and New York. Furthermore, being situated outside of the great egg-producing sections of the country, competition must come from a considerable distance.

Compared with some sections of the country, the climate in Massachusetts is very favorable to poultry culture. There are neither the severe winters nor the hot summers. The moderate climate enables us to secure hatchable eggs early in the season — a fact which results in Massachusetts leading the market in all kinds of poultry products.

The soil in this state is almost ideal for poultry keeping. A light, sandy or gravelly loam is much better than the soils found in the middle west or in the southern part of our country. Rains can easily cleanse light, sandy soils and keep them in good condition for poultry year after year, providing we do our part in the way of cultivation. Moreover, land in Massachusetts is fairly cheap, and this enables one to start a poultry farm with very little capital.

Again, the fact that meat is gradually increasing in price and becoming scarce, and the fact that egg consumption is on the increase means that for years to come poultry and eggs will demand a high price and should yield a good profit to one who understands poultry keeping.

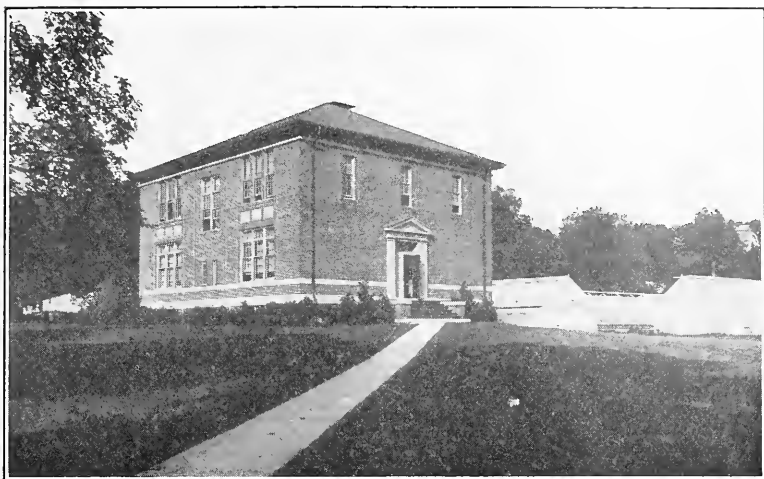
There is another advantage that the poultrymen of this section have over those in other parts of the country: the people of Massachusetts demand poultry and eggs of excellent quality, which means that over-production in certain parts of the country does not affect the prices of home products.

For those who wish to manage poultry farms for other people, or become instructors in agricultural colleges and schools, or investigators at experiment stations, the opportunities are practically unlimited.

During the past few years the Massachusetts Agricultural College has given particular attention to the development of its department of poultry husbandry. It now has one of the best departments in the country, offering a broad training in the practice as well as in the theory of poultry husbandry. Instruction is given in practically every phase of the industry, including hatching, brooding, feeding, general management, judging, and marketing poultry and poultry products.



Poultry Plant



French Hall—Floriculture, Forestry, and Market Gardening

## Floriculture

Massachusetts agriculture is characterized by intensive specialties. One of the most typical of these is the growing and selling of ornamental plants and cut flowers. This work is carried on largely under glass, but with every extensive greenhouse planting there is more or less work in the open ground. The cultivation of ornamental plants in gardens also has considerable importance throughout New England and the professional gardeners are expected to have a knowledge of this branch also.

In all these various lines there are openings for many men, and as the work requires great skill, trained men are obviously more valuable than untrained men. In no line of work is the combination of scientific education and practical skill more important. In other words, the successful man needs not only practical experience, but also the most thorough education he can possibly receive.

It is fair to say that the greatest profits in eastern agriculture are to be found in the most intensive specialties and that, for the amount of land used and money invested, floriculture is one of the

best. While the largest opportunities are open to men who engage in this line of work for themselves, there are also many chances for young men to hire out to others already established in business. As the production and selling of flowers and the care of gardens requires a great amount of labor, these opportunities to work for wages must necessarily be very numerous.

The Massachusetts Agricultural College is equipped to supply the training in the science of floriculture. Its extensive system of greenhouses offers ample opportunity for the observation of proper methods of greenhouse management and construction. For several years the department has been developed by one of the leading teachers of floriculture in this country. A careful study is made of the methods of raising the various greenhouse plants; this includes propagation, transplanting, fertilizing, fumigating, spraying, and watering. Instruction is also given, and practice required, in gathering, storing, and marketing flowers.

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## Forestry<sup>1</sup>

The field of activity for properly trained foresters is so broad and varied that no one can hope to become an expert in every branch of this subject. It is expedient therefore for the student to specialize in one or more phases as soon as he determines which branch he prefers, or rather, for which branch he is best fitted. The various specialties in which forestry students have successfully engaged include logging engineering, milling engineering, timber cruising and estimating, consulting forestry, Federal and state government forestry, commercial forest tree nurseries, and city forestry.

Logging engineering comprises the business of harvesting the forests. It includes the falling of trees and cutting them into proper log lengths; hauling the logs to local centers — that is, either to the mill or to the logging railroad and there loading them on cars. This work requires sufficient civil engineering skill to survey and map extensive areas of forest land, to locate and build logging railroads, wagon roads, bridges, and dams. It also requires sufficient mechanical skill to superintend the installation and operation of upright and horizontal stationary and portable steam engines.

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<sup>1</sup> For a more exhaustive discussion of the possibilities of this profession the prospective student is referred to Forest Service Circular 207, entitled "The Profession of Forestry" by United States Chief Forester, Henry S. Graves. This may be had free upon application to the United States Forest Service, Washington, D. C.



Milling engineering is the business of sawing the logs into lumber and either storing the lumber in yards or loading it on cars for shipment to market. It requires sufficient skill to install and operate the usual saw mill machinery.

Lumber estimating and cruising comprises the business of locating merchantable forests, estimating the quantity of timber they contain, and judging the quality of the timber. It necessitates extensive trips into forest regions not easily accessible and is apt to call for unusual physical endurance.

Consulting forestry consists in advising about, making plans for, administering, and executing forestry work of all kinds for private owners of timbered lands. Before success can be assured considerable previous experience is necessary and the degree of success depends largely on the extent of the reputation of the consulting forester.

State and government forestry represents a very broad field, embracing the entire United States inclusive of Alaska and the island possessions. This may be largely field work or it may be almost entirely office work; it may require a high degree of technical skill along special lines or it may call for general executive ability.

Commercial forest tree nursery work comprises the business of growing forest trees in large quantities in nurseries to be sold to any one who wishes to buy them. Frequently it includes also the rendering of services in connection with the actual planting of the trees sold.

City forestry is the business of setting out and caring for city trees and woodlands. This vocation also includes the preparation of extensive plans for city beautification and the management and care of city parks and public gardens.

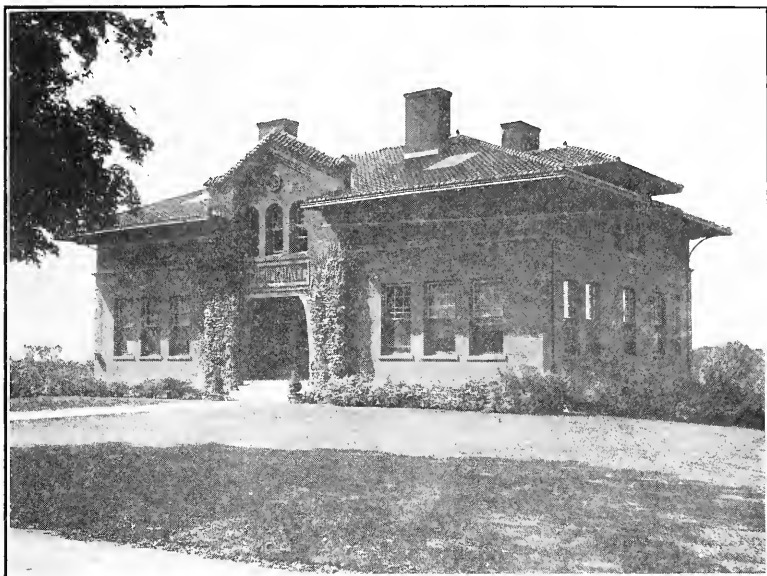
The Massachusetts Agricultural College is not prepared to give its students an exhaustive training in forestry. It does, however, give sufficient instruction to afford a general insight into the profession, and prepares men to manage intelligently the less difficult problems. Moreover, for those intending to specialize in forestry at some of the schools for advanced study, this institution offers an admirable basic training through courses in its departments of botany, entomology, floriculture, forestry, landscape gardening, and chemistry.

## Landscape Gardening

Private and public gardens are being established very rapidly throughout the United States. Practically every city now has extensive public parks, and large parks are also being established by various states, counties, and even by small towns. Such parks must be designed by highly trained men and the construction must also be carried out by men of special skill and experience. When it is considered that there are literally thousands of these public parks and hundreds of thousands of private estates to be designed, constructed and maintained, it will be seen that there are opportunities for employment for a good many properly trained men.

Young men just out of college usually find employment in park construction or maintenance, or in construction work carried on by active landscape gardeners. A few of them are employed in the work of designing and drafting. Eventually, as they acquire experience, men who are adapted to the profession are enabled to set up in business for themselves. In this way the field is open for reasonable progress to men who have the ability, the courage, and the industry to keep themselves at the front.

At the Massachusetts Agricultural College the plan of instruction embodies the careful study of the scientific principles underlying the art of landscape gardening, the study of numerous planting designs by the most noted landscape architects of the country, drawing, field work in surveying and mapping, the preparation of planting plans for specific parks, gardens or estates, and a study of trees, shrubs, and other plants used in ornamental gardening.



Wilder Hall—Landscape Gardening and Pomology

## Market Gardening

The distinctive character of modern agriculture is specialization. General farming still has its merits, but the intensive cultivation of special crops is apt to be more profitable. In New England, in particular, this principle of specialization is being applied with conspicuous success. And amongst all the lines of intensive agriculture market gardening takes a very high place—perhaps indeed the first place. The market gardeners are everywhere taking the lead in adopting the most advanced methods of cultivation, irrigation, fertilization, and marketing. In many districts they are resorting to the use of greenhouses for the production of winter and spring vegetables. In fact all the popular vegetables are now produced under glass in our climate, not in small quantities, but by hundreds of tons annually.

Market gardening, whether conducted out of doors or under glass, has two of the qualities belonging to intensive agriculture everywhere: (1) it requires the highest skill and the best training, and (2) it is capable of yielding the highest returns. The market gardener almost more than any other tiller of the soil can afford to invest in the most expensive land and the costliest farm fixtures. Equally he can

afford to invest in the very best training for his calling. The men who have the widest knowledge of the principles of modern scientific agriculture as taught in the agricultural colleges coupled with the best practical experience are the ones who are sure to win the largest success.

Opportunities for market gardening in Massachusetts are practically unlimited. This section does not produce more than a small fraction of the vegetables consumed, and probably never will. There are thousands of acres of excellent garden soil selling at relatively low figures and yet conveniently near unexcelled markets.

Besides these splendid openings for practical enterprise in market gardening there is a strong demand for competent men to fill salaried positions in teaching, experimental work, and the like. The pay is good in these positions, and this field appeals to some who do not find it possible to go into business for themselves.

The Massachusetts Agricultural College is a potent factor in preparing young men for successful careers in market gardening; a portion of its estate is devoted to the production of market gardening crops. By courses of instruction offered in the departments of agronomy, botany, and entomology, as well as market gardening, the student has superior advantages in familiarizing himself with the sciences which affect most closely the market gardening industry.



Practice in Market Gardening

## Pomology

There are four general departments of work which present themselves to young men who are proficient in the science and practice of pomology.

First and best, there are excellent opportunities to engage in fruit growing. For the right man in the right place there is perhaps no branch of farming that promises better returns. Where a young man has the necessary capital this is the line of work above all others in pomology that the department would like to see its graduates elect. There is talk in certain quarters of over-production, but the day is certainly far distant when first class fruit will not command a good price.

Second, there are always a number of positions for young men of training and experience as managers of fruit farms. It must not be expected that a young man without any practical experience can fill such a position, but the man who knows not only the scientific principles but also the practical details of orchard work, and who is capable of handling men and producing results, can, almost without exception, find profitable employment in such work. For our New England conditions it will usually increase his chances of success if he is proficient in other agricultural activities as well as in orcharding; for example, if he can manage a dairy or poultry plant, as well as an orchard, he is doubly sure of a position because the majority of our New England farms and estates are not devoted entirely to one line, but combine two or more agricultural specialties.

Third, there is always a call for teachers in pomology, both in colleges and in secondary schools. For several years there have been more of these teaching positions than the department has had qualified men to recommend, and at the rate at which courses in agriculture and horticulture are being introduced into schools this demand will certainly increase. Closely allied with this work is that of "extension teacher in pomology" and here again the demand is even now ahead of the supply of qualified men and is sure to increase markedly in the next few years.

Lastly, there is a limited demand for men to do research work in pomology. There are usually fewer men in each class who are quali-

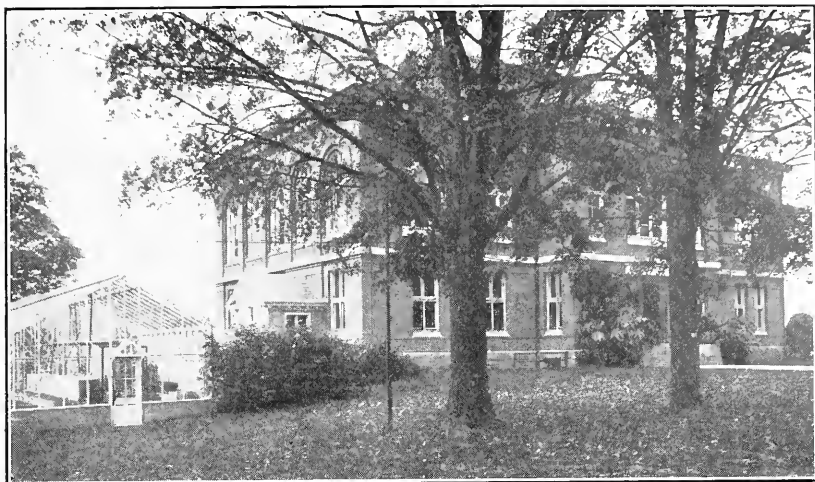


**Students Setting Out Strawberry Plants**

fied by natural aptitude and training for this work than for the others mentioned, but when a young man *is* qualified he can usually secure an excellent position.

These are the principal forms of pomological work in which there is a call for men. What remuneration the young man receives for his services depends entirely on the man himself. There is never any dearth of paying positions for the man who has executive ability, who has some practical experience, and above all who is willing to work. In fact the pomological market is like every other market: there is never enough of the best.

The department of pomology is one of the most popular at the Massachusetts Agricultural College. The classroom instruction is supplemented by practical work in spraying and pruning, also in grading, packing, and judging fruit; extensive orchards at the college and in its vicinity, and a fruit packing and storage building furnish excellent laboratories for students specializing in pomology. Every year a large number of men graduate from the institution, efficiently trained and in some cases thoroughly prepared to successfully pursue a vocation along some of the lines here described.



Clark Hall—Botany

## Botany and Plant Pathology

The department of botany at the Massachusetts Agricultural College is remarkably well equipped to give the student a thorough training in botany with especial emphasis on plant pathology and physiology. The building devoted to this work is provided with two large, well lighted laboratories, and a number of special rooms for graduate work. Annexed to the building is a greenhouse which is used entirely for experiment purposes and contains several aquaria for growing aquatic plants.

The botanical courses during the first two years are designed primarily to give fundamental training in the science. The junior and senior courses are elective. Such subjects as plant anatomy, histology, ecology, physiology, and pathology are covered in a very practical way and not only afford a fundamental training but are well adapted for those intending to specialize in general agriculture, entomology, or chemistry. Some of them might be called "information courses;" that is, they are designed to supply knowledge of a practical nature to the students electing practical courses.

The vocational subjects taught in this department include, among others, the course in plant pathology which is devoted entirely to the study of the diseases of economic plants, and is of sufficiently wide scope to afford a thorough foundation in the subject and to fit the student for experiment station work, for which trained men are always in demand. There is usually sufficient time for work on some original problem for those electing senior courses in this subject. Another vocational subject is plant physiology, which is coördinated with chemistry and furnishes training for experiment station work or teaching.

A course entitled "shade tree management" is also given. This embraces a thorough study of all the factors affecting shade trees whether produced by fungi or other causes, and a study of the structure and function of the tree. It is particularly planned for those intending to practice tree surgery, spraying and pruning, and affords a thorough and technical knowledge of the subject.

Particular attention is also given to the various diseases infecting all agricultural crops grown in Massachusetts; a careful study is made of the characteristics, method of infection, and manner of control of diseases of fruit, vegetables, grain, greenhouse plants, and shade trees.

The chief vocations in botany are found in teaching, investigational work, and in expert service in municipal, state or government employ. There is constant though not excessive demand for well trained men to fill attractive positions of the types indicated.



## General and Agricultural Chemistry

The courses in chemistry at the Massachusetts Agricultural College are arranged for a twofold purpose:

They are intended to give to every student entering the college a good understanding of the elementary principles of the subject such as an educated person should possess. Every college man should know, and the college intends to teach, the chemistry of the common things of life — such as the air breathed, the food eaten, the water drunk, and the clothes worn. The college man should have, further, a general understanding of the chemistry of digestion and the relation of chemistry to sanitation. It is also important for him, as a practical man of the world whatever his occupation, to know something about the chemistry of iron, steel, oils, paints, and cements. If he is to follow agriculture as a vocation, he should know the general composition and reactions of soils, fertilizers, insecticides, and fungicides. Of equal importance is a good understanding of the chemistry of plant and animal life, together with the composition and nutritive value of such agricultural products as cattle feeds, maple sugar and



Chemistry Laboratory

maple syrup, milk, butter, cheese, alcohol, paper, wood pulp, and the like. Several courses are intended to give the student instruction which, without being too technical in character, will enable him to understand chemical principles, and to apply them to the ordinary life processes and to the agricultural industries.

Courses are also planned for students who may desire to specialize in chemistry. The object of the strictly chemical course is to give men a thorough training so that they can take advanced work in any department of the science. The course is also intended to fit men for teachers in high schools; for assistants in college chemical laboratories; for analysts in fertilizer, cattle food, and sugar factories; for assistant chemists in municipal and experiment station control laboratories; and for assistants in the research laboratories of the experiment stations.

There is a reasonably good demand for men who are willing to devote a few years to advanced study along these lines, and who can prove their worth as faithful workers and careful investigators. The department cannot promise positions to any of its students. It does make an effort to secure places for all men whom it regards as well trained and worthy. It refuses to recommend any man who does not measure up to its requirements.



Laboratory for Entomology

## Entomology

The close and important relation of insects to the raising of crops demands some knowledge of the subject for workers in nearly every department of agriculture. The field of entomology is very extensive, about five-sixths of all living things being insects. Anything like a complete knowledge of insects, therefore, can be obtained only by the specialist. The assistance of trained entomologists is constantly needed in solving the problems of protection from and the control of insect pests. Men trained in such work obtain positions in experiment stations, as state entomologists and in the entomological work of the United States government, and also as teachers of the subject in colleges and other educational institutions. The education of men teaching agriculture in high schools, which is a rapidly broadening vocation, should include a good knowledge of insect pests and their control. In all the lines named the demand for well trained men has thus far exceeded the supply.

Work in these places (except teaching) consists largely in the investigation of the life histories and methods of control of those pests

of which this knowledge has not been as yet obtained; the answering of letters and questions which come in large numbers from farmers, and others suffering from the ravages of insects; the establishment of parasitic enemies of the pests; the accumulation of reference collections of the different stages of the various pests; and the experimental testing of various methods of control.

The entomologist then, might be described as an agricultural specialist who gives his attention to clearing up the difficulties in insect lines met with by the actual crop producers, and to the discovery of ways in which loss by insects may be reduced or avoided.

For all these vocations, the Massachusetts Agricultural College offers as good a training as may be secured anywhere in the United States. One of the largest and best equipped entomological laboratories in the country is devoted to the department. Here are studied from specimens the characteristic forms of the various types of insects. Work is required in collecting and classifying insects. To this institution perhaps more than to any other in the United States do calls constantly come for men thoroughly trained in entomology, to undertake the solution of the difficult and serious problems connected with this science.

## Microbiology

Those living forms which are beyond the range of the human eye include within their sphere of activities many of the important phenomena or realities of nature and life. They are in the air we breathe, the water we drink, the food we eat and the soil we tread. They cause many of the changes which we seek and many which we antagonize; they work for and against man. The province of microbiology is to foster these organisms in their operations favorable to man, and to hinder or prevent them in those which produce injury to man.

This work calls for men to expend their energies in several directions. There must be specialists in microbiology who will concern themselves with dairy operations, beginning with milk production and following the milk through to the consumer as milk, butter, cheese, or other milk products. Specialists are needed to devote their efforts to soil microbiology, for in this branch of science are found most of the changes occurring in the soil; these changes must be known and be made the subjects of control.

Food supervision becomes of greater importance each advancing day; through its preservation and decomposition in the processes of drying, canning, brining, and refrigerating, a wide range of possibilities arises and trained men are needed. Sanitary studies are largely based upon microbiology; through these channels the life of the nation is to be protected, and here is an opportunity to serve effectively. In veterinary and medical work perhaps no science is receiving more attention than microbiology, for in it are found the causes of many diseases as well as their cure.

Whether the microbiologist acts in the field of instruction, of research, or of control, experience has found it to be a small niche which an individual man can fill with credit to himself and the world. He should be familiar with the whole subject of microbiology and its correlated branches and with the essence of his specialty to such an extent as to express wisdom and effectiveness.

The following of agricultural practices calls for at least a working acquaintance with micro-organisms. The nature of the soil and its cultivation, the biological significance of drainage and fertilization, the value of leguminous and other crops, the management of the dairy, the dangers from infectious or contagious diseases among animals and in the home, the sanitary features of the home and stables, the care of food, and many other features involve a knowledge of micro-organisms which should be more than passing.

Men attracted by work of this character will find extensive courses offered at their state agricultural college.



Veterinary Laboratory

## Veterinary Science

The business of the man trained in veterinary science is one of the firmly established agricultural professions and is one which will always offer attractive opportunities to the person adapted to this character of work, and who thoroughly prepares himself for the profession.

The demand for well qualified veterinarians was never as great as at the present time. One reason for this is the increase in value of farm animals, which amounts in many cases to a doubling of the value of ten years ago. When values were much lower than they are today the services of the veterinarian could be dispensed with, in case of sickness, without entailing serious loss to the stock owner, but with present values his services are indispensable. There are many localities where a veterinarian can build up a lucrative private practice; this is possible in stock raising sections that a few years ago would not have supported a practitioner, owing largely to the fact that sera and vaccines which are used extensively in the prevention of disease can be administered only by the registered veterinarian.

In the United States Army two veterinarians for each regiment of cavalry are required. The United States Department of Agriculture employs each year an increasing number of veterinarians; they serve as executive officers, investigators of animal diseases, meat inspectors, live stock agents, and quarantine officers. In nearly all states veterinarians are appointed to execute the laws relative to quarantine against contagious diseases from without their borders and the control and eradication of them within. The many state agricultural colleges and experiment stations employ one or more veterinarians for teaching and investigational work relative to animal diseases. In numerous cities and towns veterinarians are employed by boards of health as inspectors of meat, milk, dairies, and slaughter houses.

For these various state and government positions, as well as for private work, the demand is for the man best qualified by study and practice to deal with the special branch of the service to which he is assigned. There is little opportunity in this profession for the man with only an ordinary training.

The courses in veterinary science included in the curriculum of the Massachusetts Agricultural College do not lead to a special veterinary degree. Neither do they fully qualify one to engage in any line of veterinary practice. In the main the veterinary instruction is supplemental to the courses in general agricultural science, although it is intended to be so broad in its scope as to meet the requirements of the practical stockman and the prospective student of veterinary or human medicine. It is the aim of the veterinary department to guide the student to a sufficient general knowledge of animal disease that he may give stock such care and treatment that diseases may be prevented whenever possible, and in case of emergency to render first aid treatment to those that are attacked by disease.

In view of the opportunities offered by the agricultural colleges for obtaining a knowledge of the subjects so closely correlated with the essential ones of the special veterinary college, it is advisable whenever time and means permit that the prospective student of veterinary medicine should pursue a full four-year course in an agricultural school before entering upon the work of the strictly veterinary curriculum. It is time and money well spent to thoroughly fit one's self for a life work.

## Beekeeping

It has been said that "beekeeping is the oldest art under the sun." True, but the business of beekeeping is young. It is, moreover, becoming much diversified and sub-divided into narrow specialties. There is the honey producer; the bee-rearer or producer, whose sole aim throughout the season may be to "make" more bees; there is the professional queen-rearer, whose business it is to rear and mate queen-bees for market; in some localities there is a tendency toward specialization in wax production from a commercial standpoint; finally there are the specialists who have become expert in handling the products of beekeepers; in some of these establishments many tons of honey are daily graded, bottled and shipped to market. Massachusetts has her increasing share in all of these industries.

With the growing recognition of the young industry, comes the demand from all parts of the country and even abroad for those who can teach and investigate or organize and develop the industry. In many states beekeepers are requiring of their beekeeping specialists field service in the suppression of brood-diseases of bees. Already the country is looking to Massachusetts, as a pioneer in this field, for men and assistance.

The beekeeping industry is already extensive, representing an income to the country of millions of dollars; but beekeeping has an even greater, more important, and fundamental agricultural aspect than any yet enumerated. It is that inestimable service of the honey bee in seed, vegetable, and fruit production. It is this horticultural relationship of beekeeping which is of deepest significance to Massachusetts as well as to the country, in fact wherever peaches, plums, cherries, pears, apples, various berries, certain seeds and vegetables are grown. Even though horticulturists till, fertilize, prune, and spray, it has been proven that their harvest may fail unless the bees are sufficient to pollinate the flowers. So particularly dependent are certain horticultural specialists, that at least two thousand to twenty-five hundred colonies of bees are annually utilized in the cucumber greenhouses of Massachusetts alone. Within the last few years Massachusetts cranberry growers have found that honey-bees assure greater success in their million dollar enterprise. Similarly field-crop growers, as of melons and cucumbers, are introducing bees on their



plantations. Likewise the commercial orchardists, small-fruit growers, and the professional seed producers realize that it is most profitable to maintain apiaries.

Instruction in beekeeping at the Massachusetts Agricultural College has primarily one aim: that of preparing the student to go forth equipped with a fundamental knowledge of the industry. But it should be borne in mind that preparation for research and investigational work requires a broad training in various other sciences, as well as in the art of beekeeping.

In order to meet the various requirements of those attending the institution, several courses are offered. For this work the instructional equipment includes an exceptional collection of apicultural and scientific literature; a museum, which doubtless contains the largest collection of products and natural history specimens, apicultural implements, machinery and materials to be found in the world; an apiary of about two acres in which is a "bee garden" with a collection of nectar-yielding plants; fifty colonies of bees of important races and types; and the "bee-house," a compact, convenient and modern apicultural laboratory, with a well equipped work-shop, wax-rendering plant, honey-room, and bee-cellar for wintering.



Bee House

## Agricultural Education

The number of opportunities are increasing rapidly for persons prepared to teach agriculture in secondary schools. Eight or ten years ago there was no appreciable demand for teachers of agriculture outside of the agricultural colleges. Today the high schools of the country are asking for more teachers of agriculture than they can obtain. In 1913 the Massachusetts Agricultural College received requests for nearly forty men to teach agriculture. The demand is always for well qualified men; the requirements named are experience in practical farm life, a study of scientific and technical agriculture, and a study of the principles and methods of teaching the subject as well as some experience in teaching. It is difficult to find men having all of these qualifications; for this reason the wages are better than for those prepared to teach in departments that are overcrowded with experts.

In addition to the routine work of teaching, the widespread and growing interest in boys' and girls' agricultural clubs, and in school gardens, is demanding both men and women to direct this work. A number of cities are promoting home and school gardens. They are seeking as directors of this work men who have both practical and professional training. This movement in garden work seems destined to result in a large amount of summer work for those who are prepared to direct it. A feature that should appeal to teachers who wish a pleasant and profitable vocation is that the work takes them out in the open.

The college offers opportunities for scientific and technical studies as well as professional study in the principles and methods of teaching. Plans are under consideration for giving candidates some practice in teaching as a part of their preparation.



School Gardens—M. A. C. Grounds

## Rural Leadership

The need of training rural leaders along business and social lines has been voiced by many thinkers. The Massachusetts Agricultural College is probably the first institution in the United States that has attempted to meet this need by developing departments of agricultural economics and rural sociology. These departments offer a series of courses that are intended to fit students for important vocational positions in rural social service.

Excellent opportunities are offered by agricultural colleges, state boards of agriculture, and the United States Department of Agriculture, especially in its new Bureau of Rural Organization, for college men trained in the economics and sociology of rural life. The demand for men to enter these inviting fields is much greater than the supply.

The widespread interest in agricultural credit, business coöperation among farmers, and generally a greater efficiency in the marketing of farm products is also calling for leadership in these activities. Not a few farmers with broad minds as well as broad acres are asking for a new type of social secretary to look after the welfare of their workers and the development of community interests. Also in connection with the recreational, sanitary, and religious interests of country communities is there an increasing call for men who have

expert knowledge of the psychology, conditions, and tendencies of rural life, together with a real love for country people. This call comes especially from leaders in the churches, the county Y. M. C. A., boards of health, and philanthropic organizations. Professor Fiske, of Oberlin, says, "Both the need and the worthiness of rural life, its social and religious crisis, and its strategic signs of promise, bring the challenge of the country to the man in college."

There is a growing consciousness everywhere that country life, which has so long been neglected in its economic and social aspects, should at last receive the recognition that it deserves. With this consciousness, we may expect a broader field for rural leadership and a growing appreciation of its service.

Perhaps the finest opportunity which presents itself to a graduate from an agricultural college, is that of establishing himself in a rural community and, if he possess the necessary qualities, becoming a leader not only in his own vocation, but also in various matters of general community interest. Thus, if he be a farmer, he may through his own economic success do much to better the farming conditions of his associates and he may at the same time exercise large influence in the social, recreational, and educational life of his town. Or, if he chooses the profession of teaching, medicine, or the ministry, he has a similar opportunity to make his personality and leadership felt in the large problems confronting the community.

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## Graduate Work in Agriculture

When agricultural colleges were first organized and experiment stations established, the character of the work was largely the extension to the new field of agriculture of such knowledge as was already available. Instruction assumed more the rôle of secondary education than college training. Research was merely confirmation and testing. Out of this incipient stage, agricultural education has been advancing to that of the highest professional plane, and research to that which

is needed for the solution of the most intricate subjects in agriculture. Here is a field for agriculturists, agronomists, animal husbandrymen, beekeepers, botanists, chemists, dairymen, economists, entomologists, floriculturists, landscape gardeners, microbiologists, physiologists, pomologists, sociologists, vegetable gardeners, teachers, and others.

This condition of intensity has reached beyond institutional walls and penetrated the domain of industries and actual agricultural practices. Park commissions are using landscape gardeners; estates employ farm managers; beet-sugar plants employ trained agriculturists and chemists; milk plants require dairymen and bacteriologists; canneries use bacteriologists and gardeners; fruitmen employ men who are plant physiologists or plant physicians; implement manufacturers prefer men with agricultural experience; states must have their entomologists, foresters, botanists, chemists, bacteriologists; and so on indefinitely into the many phases of commercial and industrial life closely allied to agriculture.

Another feature is developing in the actual managing and conducting of farms. It is being realized that there are so many complicated processes of nature involved in farming, and so much demanded in capacity, that intensive training and peculiar experience are wanted. Progress does not consist in passing on from generation to generation traditional and empirical methods but in the introducing of known facts or established knowledge into the constant remodeling of the daily duties of farm life. Only a man who possesses such knowledge (devoid of traditional prejudice), capacity, ingenuity, initiative, and a thorough knowledge of practice as recognized at the present, can be expected to throw off the shackles of age and produce a modern and scientific agriculture.

Because of these circumstances, (as has been found in every other profession so in agriculture) there must in some cases be a more extended training and an accumulation of varied experience before a young man can pass out into life and be successful.

The Massachusetts Agricultural College is prepared, through its graduate school, to train specialists in many of the branches to which reference is here made.

# Agricultural Experiment Station Work

The number of men highly qualified for experiment station work is not equal to the demand, and if a young man has reason to believe that he has ability in that direction there is every reason why he should plan to follow this as a vocation. Every young man, however, in fixing upon his life work will wish to consider its opportunities. The principal factors which are likely to influence him are:

1. The certainty of employment.
2. The financial prospects.
3. His natural fitness for the occupation.
4. The opportunities which it will afford for service.
5. The time and cost required to make the necessary preparation.

## *1. The Certainty of Employment*

There is a large and constantly broadening field of investigation open to the experiment stations — a field which will certainly afford employment for all young men with natural talent and ability in investigation; and, since the proportion of individuals gifted by nature and fitted by training for this kind of work must always be relatively small, there appears not the slightest prospect that the ranks of thoroughly qualified station workers will become overcrowded.

## *2. Financial Opportunities*

In the direction of prospective salary, experiment station work will not satisfy the ambitions of men who attach great importance to the possession of wealth. The salaries commanded even by the best of experiment station investigators are moderate or even small as compared with those commanded by men of no greater ability engaged in many lines of business or professional work. The young man, therefore, who wishes to be rich above everything else will not engage in station work. On the other hand the salaries are sufficient to satisfy all reasonable needs and the probability is that with the increasing recognition of the value of investigational work in agriculture, the salaries of the future will be relatively more generous than those of today.



One of the Experiment Station Buildings

### 3. *The Interest of the Work*

Who does not know the intense interest connected with discovery? There can be nothing more fascinating than the search for and discovery of facts, principles, and laws which are additions to the sum of human knowledge. It is true that the discovery of new principles and laws is not easy and it is also true that it often requires a large amount of routine work which to the outsider may seem like drudgery. No such work, however, can be drudgery to the true investigator for he will always recognize the essential nature of such work and is ever looking forward with hope to the time when he shall establish a principle or a law which no one has ever known before.

### 4. *Opportunities for Service*

No one who is familiar with the present state of knowledge of the scientific principles which underlie farm practice can doubt the breadth of the field for further discovery. The number of unsolved problems is far greater than the number of those that have been solved. We already know enough to feel certain that this is the case, but as our knowledge increases the breadth of our view increases also, and the investigator of future years will delve in fields which now are not even dreamed of. Whatever adds to the sum of human knowl-

edge is of service or will be of service sooner or later to the human race. No one can measure the value of the discovery of Hellreigel and Welfarth that bacteria living in symbiotic relationship with legumes in the nodules on their roots give these plants the capacity to make use of free atmospheric nitrogen. There can be no question, however, that this single discovery is worth more to the agriculture of the world than all that has ever been spent on agricultural investigation the world over. Every right-minded young man is fired with an ambition to serve the human race. There is no field in which this ambition is more likely to be gratified than in the highest type of experiment station work.

### 5. *The Amount of Preparation Required*

This consideration should not be given undue weight. If a man has ability and talent as an investigator nothing should prevent his devoting himself to that work, and where the talent and the desire to engage in such work exist, a way to meet the requirements can undoubtedly be found. The time has gone by when a man desiring to engage in such work should be satisfied with an inferior preparation. No one can expect to make satisfactory progress as an investigator who does not first take a thorough four years' college course, and who does not in addition take a post graduate course in which he carries out a piece of thorough scientific work as a preliminary to obtaining an advanced degree. In many cases it will be preferable, after having completed the four years' college course, to engage for a year or two in station work. This is desirable for two reasons: first, it will give the young man an insight into the nature of such work and he will be in a position to make up his mind more surely as to whether it is attractive to him; and second, he will gain a most valuable insight into the nature of the preparation for the work required and will therefore take up his graduate work with a broader vision and increased determination to do the work in the most thorough manner possible.



## Agricultural Extension Service

The field in agriculture which is perhaps offering the most attractive opportunities to young men and women interested in this subject is that of extension work. For the first thirty-five or forty years after the passage by Congress in 1862 of the Morrill land grant act establishing the agricultural colleges, these institutions devoted their time chiefly to teaching college students and carrying on research and experimental work. These two lines are still being developed with even more vigor and thoroughness, but in the last decade a third line of work, that of carrying out to the people the teachings of the college and the results of the research work of the experiment station, has come rapidly to the front. The intense interest in and rapid growth of extension work in this country is due to changed economic conditions, and to a realization on the part of all the people — city and country dwellers alike — that the great problem in agricultural education today is to carry to the people on the farms the vast fund of knowledge possessed by our colleges and experiment stations.

Extension service is neither advertising a college nor carrying on popular forms of propaganda work. It is a sane, dignified, and systematic attempt to teach to the people of a state the latest known facts in agricultural science and to demonstrate to them the best methods of farm practice.

During the last six years more than forty of our agricultural colleges and state universities have established departments of extension work. Legislation is pending in most of the remaining states, and proposed Federal legislation giving support for this work to the several states will enable those already engaged in this service to enlarge it in a considerable degree. Extension service in this country is hardly even in its infancy and development will no doubt be rapid during the next few years.

The field of extension work is as broad as agriculture and the sciences related to it. Men and women will be needed as general administrators and organizers of the work. Specialists are being called for in large numbers to render service in dairying, animal husbandry, poultry husbandry, farm management, soils and crops, fruit growing, boys' and girls' agricultural clubs, home economics, rural sanitation,

agricultural engineering, agricultural surveys, teachers of agriculture in high schools who can also advise with farmers, county agricultural advisers and demonstrators, community service work, farmers' co-operative organizations, and rural credit.

In training themselves for work in the extension field, young men and women should secure a thorough education in English and public speaking, the sciences, especially chemistry, geology, entomology, botany, and physics. Technical work in soils, crops, animal husbandry, dairying, poultry, fruit growing and other horticultural subjects, economics, and sociology, are absolutely fundamental. The practical side of farming, the conditions in and needs of our rural life, must be learned either prior to entering college or after graduation before one can hope for much success in extension service.

To such as possess the proper qualifications and are willing to acquire the necessary technical training and practical experience, extension work offers at the present time, so far as financial remuneration and opportunity for service are concerned, a field of labor than which there is no other of greater importance among the agricultural vocations.





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